Gulf Research Reports

Volume 8 | Issue 2

January 1989

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DOI: 10.18785/grr.0802.03

Gulf Research Reports, Vol. 8, No. 2, 107–115 Manuscript received January 3, 1989; accepted February 27, 1989

TANAIDACEA (CRUSTACEA: PERACARIDA) OF THE GULF OF MEXICO. VIII. *PSEUDOSPHYRAPUS SIEGI*, N. SP. (SPHYRAPIDAE) FROM THE CONTINENTAL SLOPE OF THE NORTHERN GULF OF MEXICO

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ABSTRACT *Pseudosphyrapus siegi*, n. sp. is described from benthic samples collected in deep water (595–2400 m) from the northern Gulf of Mexico. Of the five currently recognized species of *Pseudosphyrapus* Guţu, 1980, *P. siegi* is most closely related to *P. dispar* (Lang, 1968), a southwestern Pacific cognate and only other member of the genus having a squama on antenna 2. *Pseudosphyrapus siegi* is distinguished from *P. dispar* by: (1) a more triangular, but less acute, rostrum (2) the presence of two 4-pronged spines on the second maxilla (homologous spines on *P. dispar* are 3-pronged), and (3) the absence of a spiniform process on the chelipedal carpus. Other less noticeable differences between the two species occur in the setation or spination of the maxilliped and pereopods. Except for a small genital cone on males and developing oostegites on females, no noticeable sexual dimorphism (e.g., setation of antenna 1, enlargement or modification of chela and pereopod 1 in males) was exhibited by the specimens of *P. siegi* examined. It is probable, however, that more fully developed and sexually dimorphic males exist for *P. siegi*. The limited collection data suggests that body size in *P. siegi* may increase with depth. A key to the species of the genus *Pseudosphyrapus* is included.

Introduction

Guţu (1980) created the family Sphyrapidae to receive the type genus *Sphyrapus* Norman and Stebbing, 1886 and the new genus *Pseudosphyrapus*. He distinguished *Pseudosphyrapus* from *Sphyrapus* by the presence of a mandibular palp in the former and its absence in the latter. To his new genus he assigned three species, *P. serratus* (G.O. Sars, 1882), *P. anomalus* (G.O. Sars, 1869), and *P. dispar* (Lang, 1968), all formerly placed in the genus *Sphyrapus*. Two additional species of *Pseudosphyrapus*, *P. centobi* Băcescu, 1981 and *P. gutui* Kudinova-Pasternak, 1985, have since been described. Of the five nominal species within *Pseudosphyrapus*, three, *P. anomalus*, *P. centobi*, and *P. serratus*, are known from the north Atlantic, and two, *P. dispar* and *P. gutui*, are known from the southern Pacific and southwestern Indian Oceans, respectively (see Guţu 1980, Băcescu 1981, Kudinova-Pasternak 1985).

During studies on the deep water fauna of the northern Gulf of Mexico conducted by Texas A&M University in 1966 and LGL Ecological Associates, Inc. during 1984–1986, specimens of a sixth species of *Pseudosphyrapus* were collected. The description of this new species is presented here.

In this report females with developing, but not fully formed, oostegites are referred to as preincubatory females. The term transitional manca refers to those juveniles with the sixth pair of pereopods present, but not fully developed. Other descriptive terminology used in this report generally follows that of Sieg and Heard (1989). The following abbreviations are used in the text: BT (bottom temperature), BC (25 cm x 19.5 cm box corer), MWT (mid-water trawl), USNM (U.S. National Museum), GCRL (Gulf Coast Research Laboratory), and P 1–6 (pereopods 1–6).

Pseudosphyrapus siegi, new species
Figures 1–5

Synonymy: *Sphyrapus* sp. 1: Gallaway, Martin, and Howard (1988)

Type Material

Holotype – Subadult (?) male (body length 6.0 mm, cephalothorax length 1.5 mm), USNM 221853, 28°04.3'N, 086°34.8'W, 1410 m, BT 4.3°C, LGL Sta. E-4 (2417), Cruise 2, BC, April 17, 1984.

Paratypes – One subadult female (4.0 mm), USNM 221854, 26°57.6'N, 089°35.1'W, 2400 m, BT 4.2°C, C-5 (2337), Cruise 2, BC, April 14, 1984; 1 subadult female (6.1 mm), GCRL-1134, 1 subadult (?) male

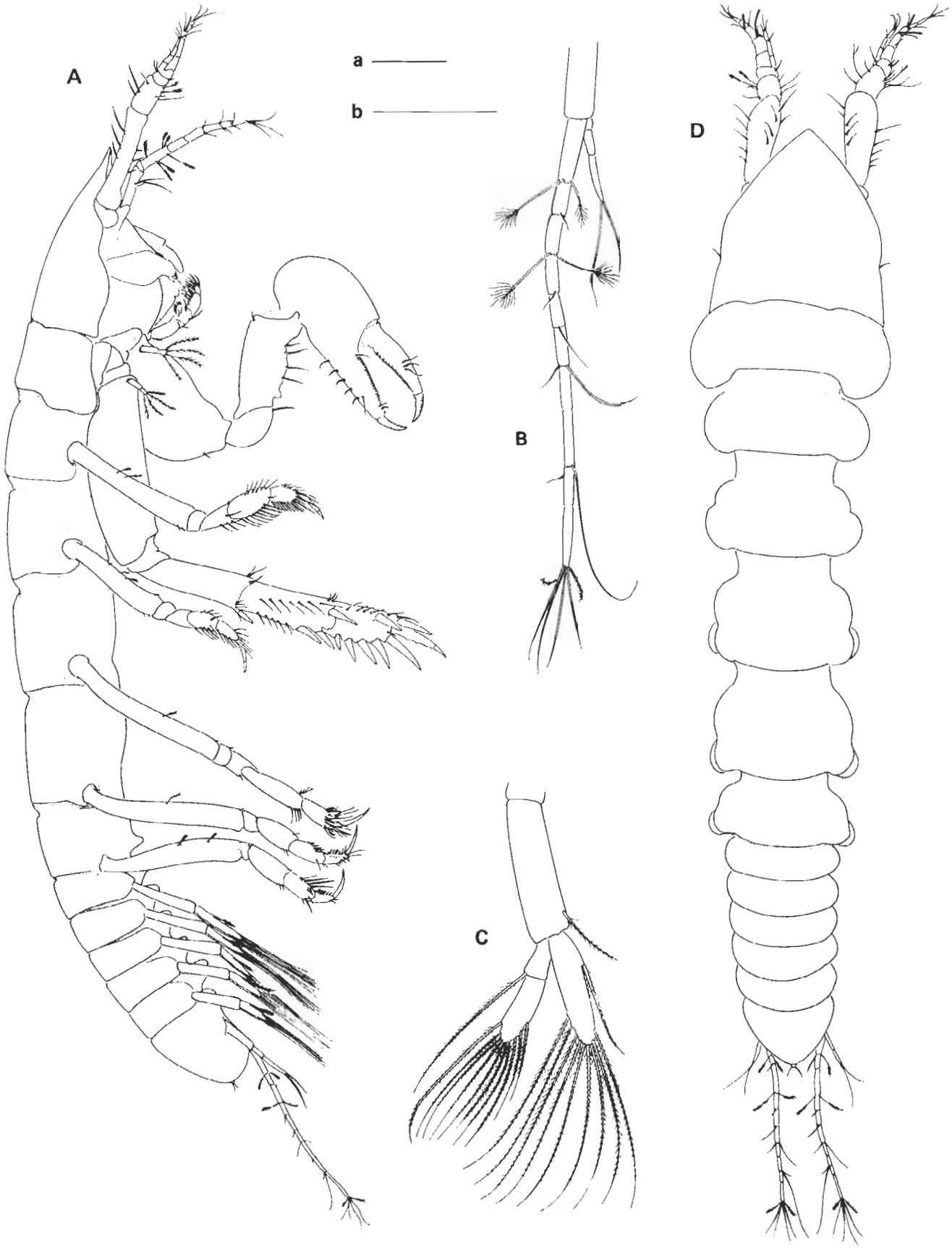

Figure 1. ***Pseudosphyrapus siegi*** **n. sp. (A) subadult(?) male holotype, lateral view; (B) uropod, preincubatory female (6.0 mm); (C) pleopod 1, preincubatory female; (D) holotype, dorsal view. Scale a = 0.2 mm for B, C; Scale b = 1.0 mm for A, D.**

(6.1 mm), coll. of J. Sieg, 28°20'N, 087°03'W, 1097–1189 m, R/V Alaminos, Sta. 66-A5-4, MWT (hit bottom), W. Pequegnat, coll., April 6, 1966.

Additional material

One subadult female (5.7 mm, dissected remnants), 1 preincubatory female (6.0 mm, dissected remnants), GCRL-1135, 28°13.5'N, 087°04'W, 1000 m, R/V Alaminos, Sta. 66-A-9-XV, MWT (hit bottom), July 11, 1966, W. Pequegnat, coll.; 1 subadult female (5.2 mm), 1 transitional manca (3.0 mm), 1 manca (2.0 mm), USNM 221856, 27°28.3'N, 089°47'W, 1390–1394 m, BT 4.3°C, LGL Sta. C-4 (2257,2271, 2278), Cruise 2, BC, April 13, 1984; 1 subadult female (4.0 mm), USNM 221857, 27°29.1'N, 089°47.25'W, 1388 m, BT (unknown), LGL Sta.C-09 (3054), Cruise 3, BC, November 15, 1984; 1 small preincubatory female (3.7 mm with developing oostegites), USNM 221855, 27°54.5'N, 090°6.2'W, 595 m, BT 7.5°C, LGL Sta. C-2 (2183), Cruise 2, BC, April 11, 1984.

Diagnosis

Rostrum triangular, lateral margins straight or slightly convex, fusion with cephalothorax uninterrupted laterally; mandibular palp, segment 2 with 7 distal setae; maxilliped, coxa with 5 short spinules on lateral margin, distal segment of palp with 9–10 setae; maxilla 1, distal segment of palp with 5 to 6 subterminal harpoon-tip setae and 1 terminal hooked seta; maxilla 2, fixed endite with 2 large four-pronged spines, 1 bifurcate spine, 4 finely serrate spines, and 1 simple spine; cheliped with carpus lacking distal spinose process on anterior margin; postero-lateral margins of pleonites rounded in dorsal view.

Description of subadult female

Body (as in Fig. 1A, D) – 4.0–6.1 mm long, about 4.0 times longer than wide.

Cephalothorax (as in Fig. 1A, D) – Approximately as long as broad, anterior third narrowed, tapering to fuse with rostrum; rostrum triangular, fusion with cephalothorax uninterrupted laterally; 1 small pair of mid-lateral setae evident. Eyelobes reduced, rounded, without visual elements.

Pereonites (as in Fig. 1A, D) – Lateral margins appearing gently rounded in dorsal view, margins of each somite with 1 setae ventrally not visible from dorsal view; first pereonite widest, 3 times broader than long; pereonite 5 nearly twice length of pereonite 6.

Pleon (as in Fig. 1A, D) – Less than half length of pereon; pleonites similar in size, each approximately 2/3 length of last pereonite, each pleonite with postero-lateral margins rounded in dorsal view (Fig. 1D) and with rounded conical ventral process (Fig. 1A).

Antenna 1 (Fig. 2A) – Peduncle 3-segmented, setation as illustrated, first segment strongly developed and nearly as long as the remaining segments and flagella combined, second segment approximately 2/5 length of first, third segment reduced with complex sculpturing and articulation with flagella; smaller dorsomedial flagellum composed of 3 segments, first and second segments with outer distal margin bearing single simple curved seta, third segment terminating 1 broom seta and 3 curved basally inflated simple seta; larger ventral flagellum composed of 4 (?) segments narrowing distally, articulation with last peduncle segment complex having partially articulated scale or reduced segment bearing small broom seta distally, first (distinct) segment lacking setae, second segment with 1 simple seta and 1 aesthetasc distally, third segment with 2 simple setae and 1 aesthetasc distally, fourth segment appearing partially segmented with 1 small simple seta midlength at pseudoarticulation and terminating in 3–4 basally inflated setae.

Antenna 2 (Fig. 2B) – Peduncle, first segment stout (width about 3/4 length), inner face concave with surface rugose; second segment nearly twice length of segment 1, but distinctly narrower with midventral margin bearing minute squama ("socle" of Lang 1968) having a long terminal seta. Flagellum with 7 segments decreasing in width distally, first segment short, wider than long with single small seta dorsally; second segment elongate, bearing several broom and small simple setae distally and near midlength, length slightly longer than combined lengths of segments 3–7; third segment without setae; fourth, fifth, and sixth segments each with a dorsal and a ventral seta distally, distal broom seta also present on fifth segment; seventh segment with 3 terminal simple setae.

Labrum (Fig. 2D) – Bipartite with clump of setae below division on lower half.

Mandibles – With well developed pars molaris, pars incisiva, and palp (Fig. 3C). Pars molaris (Fig. 3A) having oval grinding surface with outer margin bearing 1 semicircular row of setae and sharp spine-teeth; pars incisiva of right mandible (Fig. 3D) with 4 serrate spine-setae and lacinia mobilis reduced, bilobate (1 lobe acute, other denticulate); pars incisiva of left mandible (Fig. 3E, F) with 4 long, deeply bifurcate, serrate spine-setae, lacinia mobilis well developed with 4 prominent teeth; palp (Fig. 3B) 3-segmented, segment 2 with 7 distal plumose setae, segment 3 with 16–17 plumose setae.

Labium (Fig. 2C) – Covered with setae; palp with 1 terminal, distally bifurcate seta with one of its tips also minutely bifurcate.

Maxilla 1 (Fig. 4A, B) – Outer endite with 11 terminal spines, 2 subterminal spines; inner endite with 4

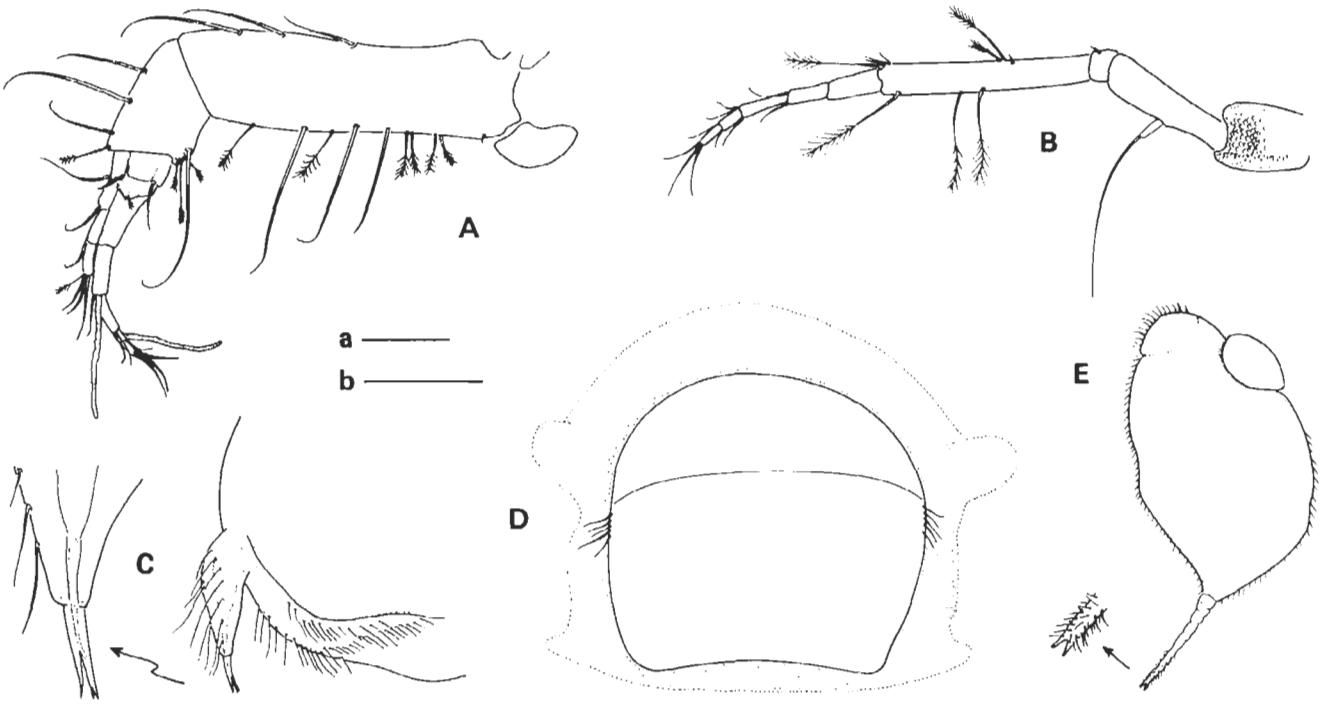

Figure 2. ***Pseudosphyrapus siegi*** **n. sp. Preincubatory female (6.0 mm). (A) antenna 1, (B) antenna 2, (C) labium, (D) labrum, (E) epignath. Scale a = 0.1 mm for C, D; 0.2 mm for A, B; Scale b = 0.2 mm for E.**

stout, pinnate setae; palp having distal segment armed with 1 long terminal seta with uncinate tip, and 5 to 6 subterminal, shorter, "harpoon-tipped" setae.

Maxilla 2 (Fig. 4E) – Shape typical of genus. Fixed endite with 2 short, subapical, plumose setae; distal margin armed with 2 large 4-pronged spines, 1 bifurcate spine, 4 finely serrate spines, 1 simple spine. Movable endite with inner lobe bearing 8 setae (2 adjacent to fixed endite with broad, finely setose bases); outer lobe with 6 large setae (2 finely setose near base). Medial setal row with approximately 36 setae, appearing distally bifid; 3 serrate spine-setae on disto-medial margin immediately adjacent to setal row.

Maxilliped (Fig. 4C, D) – Coxa well developed with 5 short plumose spinules along lateral margin, basis reduced (not figured); palp 4-segmented, segment 1 nearly as long as broad; endite with 2 couplers, 14 plumose setae, and 4 rectangular, longitudinally grooved, plumose spine-setae.

Epignath (Fig. 2E) – Broad with 2 frontal lobes present, covered with fine setae, terminal spine bifurcate, finely setose distally.

Cheliped (Fig. 5A, B) – Basis with 2 short setae, exopod prominent with 4 terminal plumose setae; merus with 1 anteromedial seta; carpus longer than merus, 4 posterior setae, 1 distal anterior seta; fixed finger of propodus with 5 posterior setae, 4 distal posterior setae, 1 seta at articulation of dactylus; dactylus with clump of 3 setae; teeth on grasping and/or cutting edges of propodus and dactylus as figured (5B).

Pereopod 1 (Fig. 5C) – Coxa as broad as long with 1 small distal seta; basis 4 times longer than coxa, exopod small with 4 terminal plumose setae; ischium very short, 1 distal posterior seta; merus half as long as basis, 1 posterior, subterminal spine, 5 posterior setae, 4 anterior seta; carpus nearly same length as merus, flexor margin with 2–4 spines on distal half and 3 setae on proximal half, extender margin with row of 7–9 setae, and distal spine; propodus with flexor margin bearing 4 to 5 spines (increasing in size distally) and 1 small distal seta, extender margin with distal half bearing 2 spines and 3 setae; dactylus same length as carpus, with 3 minute teeth on flexor margin, 1 minute proximal seta on extender margin.

Pereopod 2 (Fig. 5D) – Basis more slender than P 1 with 2 broom setae on mid-anterior margin; ischium like that of P 1; merus with 1 distomedial seta and 3 setae on distal half of flexor margin; carpus with 10 spiniform setae on flexor margin and 6 spiniform setae on extender margin, 1 small medioproximal seta, 1 mediodistal seta; propodus with 9 spiniform setae on flexor margin and 5 spiniform setae on extender margin; dactylus styliform with small proximal seta on extender margin and small deeply cleft subapical setule just proximal to small unguis.

Pereopod 3 (Fig. 5E) – Similar proportions and armament as for P 2; except merus having 1 seta on flexor margin; carpus with 5 spiniform setae on extender margin.

Pereopod 4 (Fig. 5F) – Distinctly larger than other pereopods. Basis with 1, posteromedial, plumose seta;

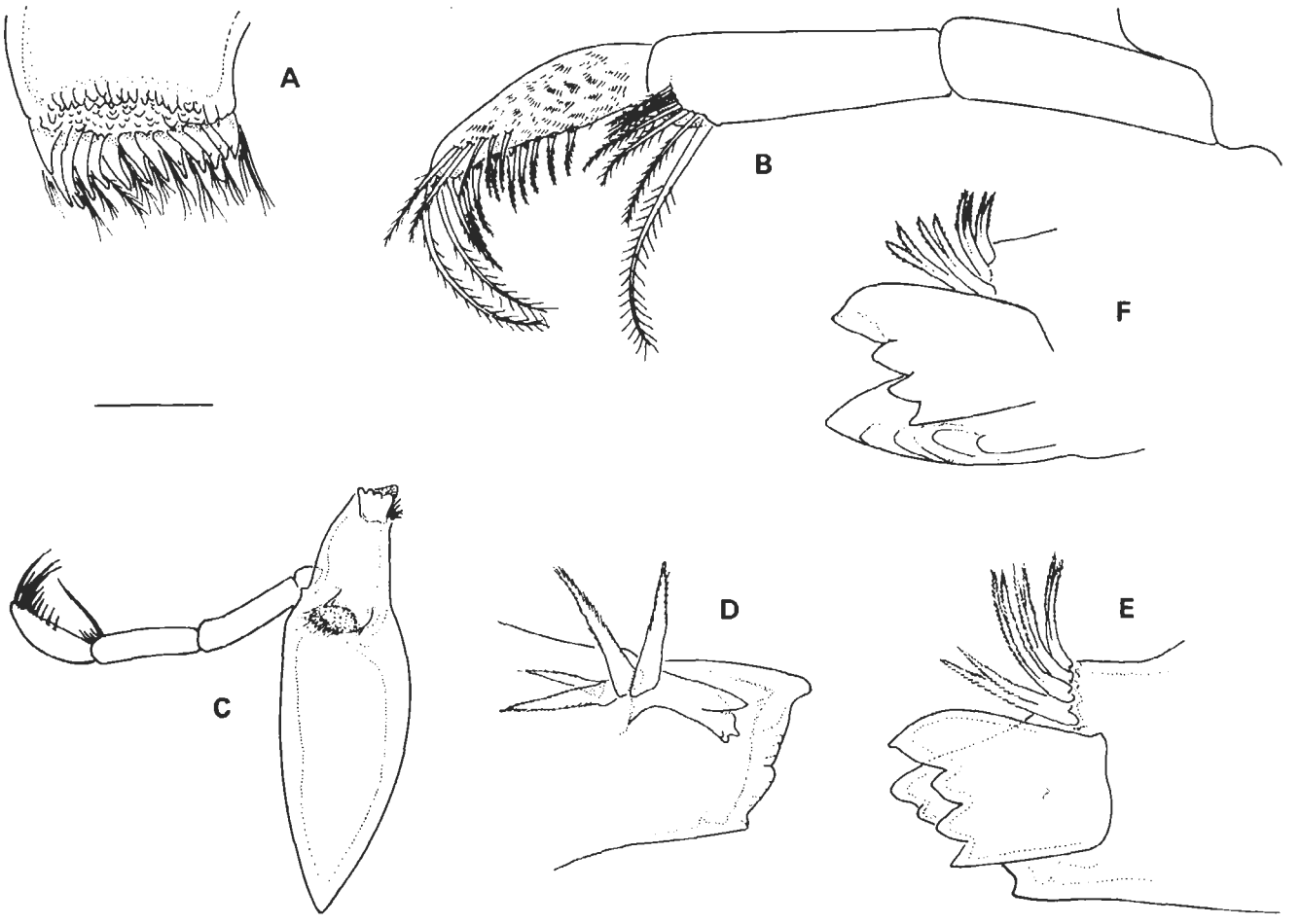

Figure 3. ***Pseudosphyrapus siegi*** **n. sp. Preincubatory female (6.0 mm). (A) pars molaris; (B) palp; (C) left mandible; (D) right mandible, pars incisiva; (E–F) left mandible, two views of pars incisiva and lacinia mobilis. Scale = 0.05 m for A, D–F; 0.1 m for B; 0.2 m for C.**

ischium as in P 3; merus with 2 setae distally on posterior margin; carpus about 1.5 length of merus with distal half having 10 spiniform setae; propodus with flexor margin bearing 5 spiniform setae, 2 subterminal rows each with approximately 12 serrate setae; dactylus narrower than P 3, but with similar setation.

Pereopod 5 (Fig. 5G) – Shorter than P 4. Basis equal to combined lengths of other segments, setation similar to P 4 except having 4 short medioproximal setae; ischium and merus similar to P 4; carpus slightly longer than propodus, 2 rows of spiniform setae, 5 in each row, along flexor margin and 1 distal spiniform seta near extender margin; propodus with 6 spiniform setae on flexor margin, 2 distal spiniform setae on extender margin, 1 distomedial spiniform seta, 3 rows of dendrite spinules on inner face; dactylus as in P 2–4.

Pereopod 6 (Fig. 5H) – Some what similar to P 5, but shorter. Basis shorter than combined length of other segments, 6 or more medioproximal setae present, 2 plumose setae on extender margin, 1 proximal and 1 distal simple seta on extender margin; ischium and merus similar to P 3; carpus equal in length to merus, two rows of spiniform setae, 4–5 in each row; propodus with row of 5 spiniform setae, increasing in size distally, near flexor margin, 1 distal spiniform seta near extender margin and 1 spiniform seta near distomedial margin, 20 or more dendrite spinules on inner face; dactylus as in P 1–5.

Pleotelson (as in Fig. 1D) – Typical of genus; posteriorly rounded, subovate with small mid-posterior process bearing 2 terminal setae.

Pleopods (Fig. 1C) – 5 similar pairs. Protopod (basis) with 1 long feathered seta distomedially; exopod 1-segmented, 1 feathered proxomedial seta serrated at tip, 4 subterminal feathered setae, 5 terminal feathered setae; exopod 2-segmented, segment 1 with 1 terminal feathered seta, segment 2 with 4 subterminal, 6 terminal feathered setae.

Uropod (Fig. 1B) – Basis about 3 times longer than wide, no setae; exopod 3-segmented, 2 long setae at tip; endopod 10-segmented, segment 1 with 2 distal feathered setae, segment 2 with 1 distal simple seta, segment 3 with 2 distal feathered setae, segment 4

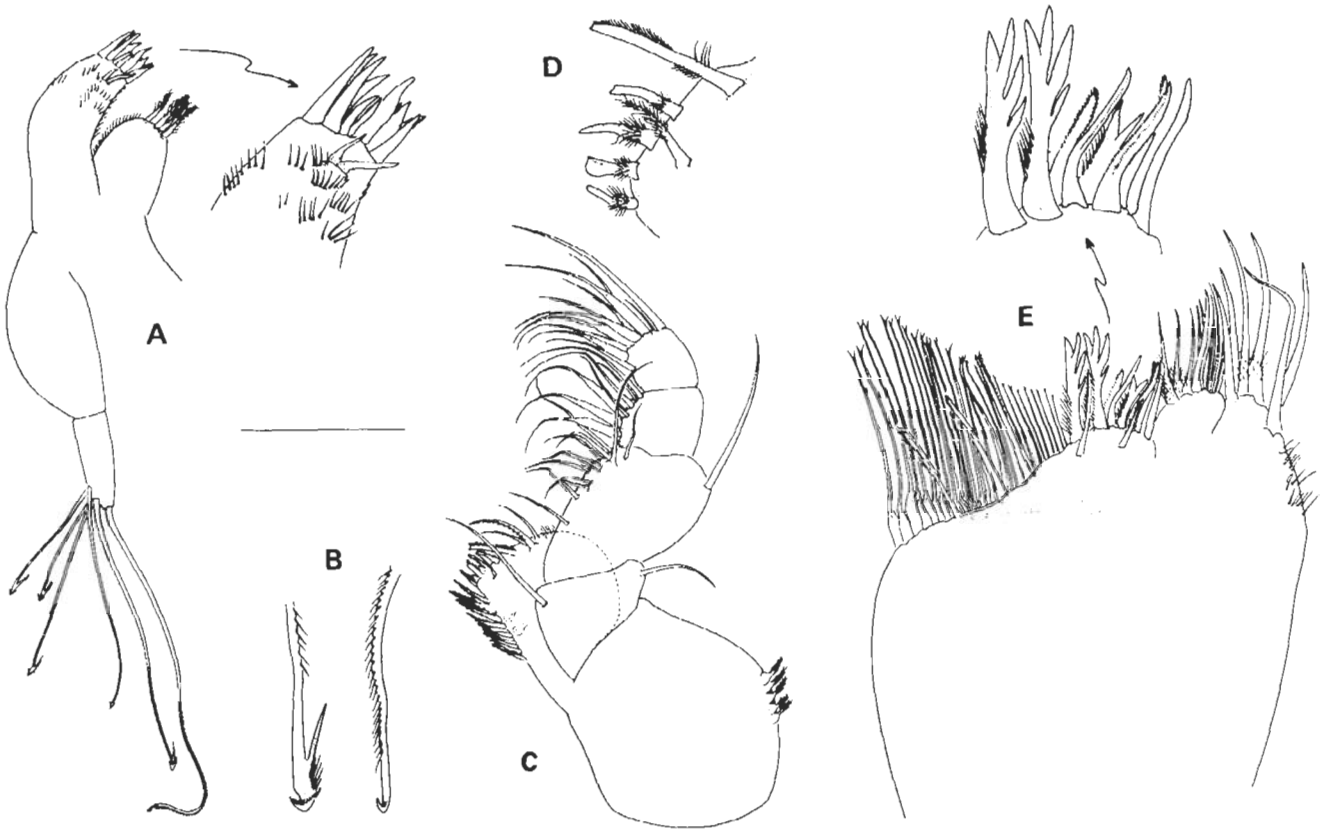

Figure 4. ***Pseudosphyrapus siegi*** **n. sp. Preincubatory female (6.0 m). (A) maxilla 1 with enlargement of outer endite, (B) tips of a "harpoon-tipped" subterminal seta (left) and uncinate or hook-tipped terminal seta (right) from palp of maxilla 1, (C) maxilliped, (D) enlargement distal part of maxillipedal endite, (E) maxilla 2 with enlargement of spines on fixed endite. Scale = 0.2 mm for A–C; 0.1 for E.**

and 5 each with 1 distal simple seta, segment 6 with 2 distal simple setae, segment 8 with 1 very long and 1 short distal seta, segment 10 with 4 long simple and 2 feathered setae at tip.

Preincubatory females (3.7–6.0 mm) – With the exception of incompletely developed oostegites on P 1–5 (Fig. 5C, D, E), they resemble subadult females.

Subadult Males (6.0–6.1 mm) – With the exception of having a small genital cone, the two apparently subadult males from our samples resemble subadult females.

Etymology

The species is named for Jürgen Sieg in recognition of his many contributions to the study of the Order Tanaidacea.

Remarks

The shape of the rostrum immediately distinguishes *Pseudosphyrapus siegi* from all other members of the genus. Of the five currently recognized species of *Pseudosphyrapus*, *P. siegi* appears to most be closely related to *P. dispar*, a southwestern Pacific species presently known only from four females, two subadult and two preincubatory, taken at 610 m in the Tasman Sea off New Zealand (Lang 1968). *Pseudosphyrapus siegi* and *P. dispar* appear to be the least derived members of the family, since they still retain a vestigial squama on antenna 2. *Pseudosphyrapus siegi* is distinguished from its southwestern Pacific cognate by: (1) a more triangular, but less acute, rostrum (2) the presence of two 4-pronged spines on the second maxilla (homologous spines on *P. dispar* are 3-pronged), and (3) the absence of a spiniform process on the chelipedal carpus. Other more subtle differences between the two species occur in the setation or spination of the antennae, pereopods and maxilliped.

The following key, modified from Sieg (1986), may be used to separate the species currently assigned to the family Sphyrapidae.

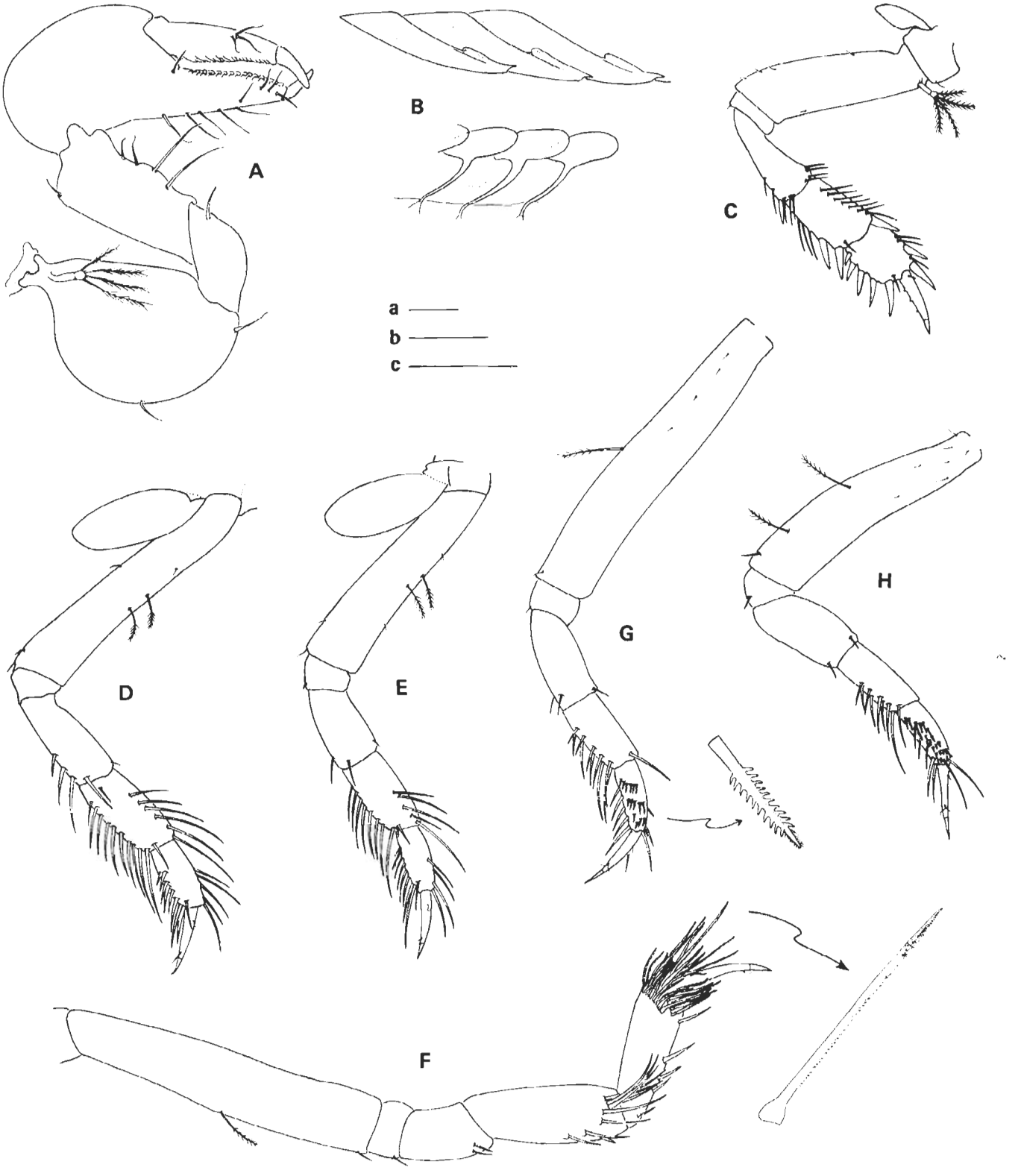

Figure 5. *Pseudosphyrapus siegi* n. sp. Preincubatory female (6.0 mm). (A) right cheliped, (B) enlargement of 3 upper and 3 lower teeth of chela, (C–H) pereopods 1–6 respectively. All scales = 0.4 mm: a for C; b for A; c for D–H.

KEY TO THE SPECIES OF THE FAMILY

1. Mandible without palp, (telson acute posteriorly or with acute posterior process) (subfamily Sphyrapinae Guţu, 1980) 2

   Mandible with 3-segmented palp (subfamily Pseudosphyrapinae Guţu, 1980) 3

2. Pleonite 2 with lateral margins each armed with large spiniform process . . . . . *Sphyrapus malleolus* Norman and Stebbing, 1886

   Pleonite 2 with lateral margins unarmed, similar to other pleonites . . . . . *Sphyrapus tudes* Norman and Stebbing, 1886

3. Antenna 2 without squama on peduncular segment 2 4

   Antenna 2 with small vestigial, 1-segmented squama with long distal seta, on peduncular segment 2 7

4. Uropodal peduncle having lateral margin armed with 2 large setae (1 proximal and 1 distal) . . . . . *Pseudosphyrapus gutui* Kudinova-Pasternak, 1985

   Uropodal peduncle without 2 large setae 5

5. Rostrum broadly rounded, lacking terminal denticles; last pereonite distinctly broader than first pleonite . . . . . *Pseudosphyrapus centobi* Băcescu, 1981

   Rostrum with sub-acute tip, having 4 or more minute terminal denticles; last pereonite not distinctly broader than first pleonite 6

6. Pleonites with acuminate, laterally projecting, epimera . . . . . *Pseudosphyrapus serratus* (G. O. Sars, 1882)

   Pleonites simple and rounded, without acuminate epimera . . . *Pseudosphyrapus anomalus* (G. O. Sars, 1869)

7. Cheliped having carpus armed with spiniform process on extender margin; pleonites with acuminate, laterally projecting epimera . . . . . *Pseudosphyrapus dispar* Lang, 1968

   Cheliped without spiniform process on carpus; pleonites with rounded lateral margins . . . . . *Pseudosphyrapus siegi* n.sp.

DISCUSSION

Except for a small genital cone on males and developing oostigites on females, no noticeable sexual dimorphism (e.g., setation of antenna 1, enlargement or modification of chela and pereopod 1 in males) was exhibited by the specimens of *P. siegi* examined. No females of *P. siegi* having fully developed oostegites occurred in our samples; this was also the case for the material of *P. dispar* and *P. centobi* studied by Lang (1968) and Băcescu (1981), both of whom also lacked the male stages of their species. J. Sieg (personal communication) has examined additional material of *P. dispar* and has observed fully developed, sexually dimorphic males for this species. Except for the presence of a genital cone, the two males of *P. siegi* examined during this study were nearly indistinguishable from those females which lacked developing oostegites. It is probable, however, that more fully developed and sexually dimorphic males such as those now known for *P. anomalus, P. dispar,* and *P. serratus* (see Sars 1899, Guţu 1980) exist for *P. centobi, P. gutui,* and *P. siegi.*

Only two preincubatory females occurred in our material of *P. siegi* from the Gulf of Mexico. The smallest of these (3.7 mm) was collected in relatively shallow water (595 m) where the bottom temperature was 7.5°C, while the larger specimen (6.0) was collected at a depth of 1000 m. The remaining four subadult females, which lacked oostegites, ranged in length from 4.0 to 6.0 mm and occurred in depths from 1000 to 2400 m where bottom temperatures were below 5°C. These limited data suggest an increase in body size with depth for *P. siegi.* A similar direct relationship of an increasing body size with depth for populations of *P.* cf. *anomalus* in the northern Gulf of

Mexico has been observed by one of us (RWH). A larger series of specimens from different depths and additional ecological data (e.g., pressure, sediment composition, bottom temperature) will be needed to determine if there is an overall increase of body size with depth in northern Gulf populations of *P. siegi*.

Acknowledgements

The majority of the specimens reported on in this publication were provided by LGL Ecological Research Associates, Inc. and were collected through funding by the U. S. Department of Interior, Minerals Management Service, Gulf of Mexico Regional OCS Office under Contract Nos, 14-12-0001-30046 and 14-12-0001-30212. Dr. Linda Pequegnat and Mr. Randall L. Howard kindly provided data from the LGL Research Associates, Inc.'s Northern Gulf of Mexico Continental Slope Study. We also wish to thank Dr. Linda Pequegnat for making available additional specimens collected during the cruises of the R/V Alaminos during 1966. We are most grateful to Gabriele H. Meyer, Jerry A. McLelland, and Sara LeCroy for help in the preparation and inking of the figures and for making constructive comments on earlier drafts of the manuscript. The manuscript benefited greatly from the constructive comments and suggestions of two anonymous reviewers.

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